

[Please amend claim 7 to read as follows:]

A3
enc 7. (amended) The substrate processing system of claim 1, wherein said cooling plate is a stationary plate or moving plate.

Please amend claim 9 to read as follows:

A4 9. (amended) The substrate processing system of claim 1, wherein said cooling plate cools the temperature down from about 350°C to about 80°C.

Please cancel claim 3.

REMARKS

Status of the Claims

Claims 1-24 are pending. Claims 18-24 are withdrawn from consideration. Claims 1-17 are rejected. Claims 1, 4, 6-7, and 9 are amended herein. Claim 3 is canceled.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendments. The attached page is captioned **"VERSION WITH MARKINGS TO**

SHOW CHANGES MADE". No new matter has been added.

Reconsideration of the pending claims is respectfully requested.

Claim amendments

Claim 1 was amended to overcome prior art rejections under 35 U.S.C. 102(e) and 103(a) as listed *infra*. This amendment is supported in the specification on page 9, lines 12-29 and in Figures 4-5. Claims 2 and 12-13 are dependent on amended claim 1. Claim 3 was canceled and thus, claims 4, 6-7 and 9 were amended to depend from amended claim 1.

The U.S.C. §102(e) rejection

Claims 1-2 and 12-13 are rejected under 35 U.S.C. 102(e) as being anticipated by **Hofmeister** (U.S. 6,318,945 B1). Applicants respectfully traverse this rejection.

The Examiner states that **Hofmeister** shows the invention as claimed including a load lock chamber with a double dual slot load lock constructed at a same location for a multi-chamber apparatus (Figs. 2-3; col. 2, line 62 – col. 3, line 57). **Hofmeister** discloses a substrate transport and load lock assembly

built at one location as a single unit. The assembly generally has a frame, a substrate elevator and a transport (Fig. 3, col. 3, lines 43-44). A robot unloads or loads substrates into or out of the transfer chamber and an arm mechanism loads or unloads substrates to or from a portable substrate carrier.

The load locks in **Hofmeister** are not dually slotted and the slots to receive the substrate(s) are not built into the load lock, instead substrates are moved into and out of the load lock via a movable substrate support that can hold multiple substrates (Fig. 3, col. 3, line 67 to col. 4, line 23). The frame of the assembly has three stacked areas; the top and bottom areas function as load locks and are isolated from the middle area and from each other only by the movement and subsequent location of the sealing plates on the substrate supports (Fig. 3, col. 3, lines 48-50 & col. 4, lines 32-47). Each load lock area receives only one of two substrate supports; each substrate support is connected to a vertical drive and moves independently of the other.

In Applicant's invention, the double load locks comprise an upper and a lower load lock where each load lock is a distinctly separate unit. Each load lock has dual slots comprising an upper slot

to receive pre-processed substrates from the ACLS and a lower slot to receive processed substrates from the transfer chamber; thus both of the dual slotted load locks are simultaneously in use. Neither the upper nor the lower slotted load lock is designed to accommodate a multiply-slotted movable substrate support.

Additionally, the upper slot in each of the load locks is designed to heat the pre-processed substrate while the lower slot in each of the load locks cools the processed substrates. Thus, if a preprocessed substrate is being heated in the upper slot of the upper load lock, then a processed substrate is being cooled in the lower slot of the lower load lock and vice versa. The ACLS side and the transfer chamber each have a single robot to load or unload substrates. In **Hofmeister**, in contrast to the instant invention, the substrates are placed on or removed from multiple slots in the substrate support and then the entire substrate support is moved to or from the load lock from or to the portable substrate carrier. **Hofmeister** does not disclose any heating/cooling means in either of the load lock areas.

Applicants have amended independent claim 1 to incorporate dependent claim 3, thus reciting a dual slot load lock having a heating plate and a cooling plate located within different

slots within the same load lock. As amended claim 1 specifically recites the heating/cooling plates in each of the dual slot load lock, it is not anticipated by **Hofmeister**. The loading of a wafer or of a glass substrate and the use of a vacuum robot with a Z-drive in the transfer chamber are specific features of the load lock chamber of amended claim 1. Thus, as claims 2 and 12-13 depend from amended claim 1, the features recited in these dependent claims are also not anticipated by **Hofmeister**.

Applicants submit that the double dual slot load lock recited in amended claim 1 is not the substrate transport and load lock assembly as taught in **Hofmeister**. For a valid §102 rejection, the prior art references must contain each element of the claimed invention. Absent teachings of a dual slotted load lock comprising a heating plate and a cooling plate in each load lock, **Hofmeister** does not anticipate Applicant's claimed invention. Therefore, as this reference is not valid prior art against the instant application under 35 U.S.C. §102(e) and in view of the preceding remarks, Applicants respectfully submit that the **Hofmeister** reference does not anticipate claims 1-2 and 12-13 under 35 U.S.C. §102(e).

Accordingly, Applicants request that the rejection of claims 1-2 and 12-13 under 35 U.S.C. §102(b) be withdrawn.

The U.S.C. §103(a) rejections

Claims 3-11 are rejected under 35 U.S.C. §103(a) as being unpatentable over **Hofmeister** in view of **Ghanayem et al.** (U.S. Patent No. 6,106,634). Claims 14-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over **Hofmeister** in view of **Iwai et al.** (U.S. Patent No. 5,562,383). Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over **Hofmeister** in view of **Maydan et al.** (U.S. Patent No. 5,224,809). These rejections are respectfully traversed.

Hofmeister is cited by the Examiner as described above. The Examiner states that **Ghanayem et al.** discloses an entry loadlock chamber that can be used to perform certain processing steps involving heat and using heating plates (col. 8, lines 21-56). Thus, it is the Examiner's opinion that one of ordinary skill in the art would find it obvious to incorporate heating plates into the substrate transport and load lock assembly of **Hofmeister** because this will allow beneficial effects to the process. Further, the Examiner states

that a heating plate may be adjusted by temperature to be a cooling plate. Applicants respectfully disagree.

Ghanayem et al. teach an apparatus and methods of reducing particulate contamination on a plurality of substrates during transfer of the substrates in a process which uses thermophoretic forces generated from preheating the substrates to repel particles from the substrate surfaces (Abstract, col. 2, lines 51-59). Preferably, the substrates are preheated in a preheating chamber prior to being transferred to a buffer region that has a particular pressure higher than that of near vacuum; subsequently the preheated substrates are transferred to a reaction chamber (col. 2, lines 43-51). The substrates are passed through the buffer region between each successive step of the process to maintain a particle-free substrate surface.

Ghanayem et al. further discloses that the substrates may be preheated in the load lock chamber using resistively heated platens or heat lamps (col. 6, lines 36-38). Although preheating in the load lock allows the plurality of substrates to be heated simultaneously, **Ghanayem et al.** maintain that heating the substrates in a preheater may be desirable to avoid complicating the

load locks with heating mechanisms (col. 6, lines 39-44). **Ghanayem et al.** do not disclose how such a heating means is disposed within the load lock.

Applicants have canceled claim 3. As disclosed *supra*, it is a recited feature of the instant invention, as amended in claim 1, that a heating plate is located in the upper slots of each of the dual slot load locks and a cooling plate is located in the lower slots of same. This allows simultaneous use of the dual slotted load locks which, *inter alia*, improves throughput. Assuming, *arguendo*, that **Ghanayem et al.** suggests to one of ordinary skill in the art to put a heating means in the substrate transport and load lock assembly of **Hofmeister**, still this is not Applicant's invention. In addition to the differences disclosed *supra*, **Hofmeister** has no cooling means in the load locks in its assembly nor is there any suggestion or teaching in **Ghanayem et al.** to use a cooling means in the load lock.

Additionally, Applicants agree that a heating plate can be adjusted to a temperature conducive to cooling and that it is known in the art to use gases for a heating and/or cooling effects. Even though it perhaps would be possible for an artisan with ordinary skill in the art to incorporate such a heating/cooling means within

the load lock areas in **Hofmeister's** substrate transport and load lock assembly, again, there is no such suggestion in **Ghanayem et al.** to do so. The process disclosed in **Ghanayem et al.** requires that the substrate temperature be kept above the temperature of any of the gases that may be used in the load lock, the preheater, the buffer region or any of the process chambers whether the substrate is a preprocessed substrate or a processed substrate being transferred back to the load lock for removal (col. 13, lines 39-42). Thus, thermophoresis is in effect for each step of the particular process used including loading and unloading the substrates to/from the load lock. Applicants reiterate that the instant invention comprises both a heating plate and a cooling plate in separate upper and lower slots in both load locks that work in conjunction to facilitate faster processing of substrates.

Iwai et al. teach using a flip type door that securely closes a chamber through which a number of semiconductor wafers are placed (Fig. 25, col. 33, line 65 to col. 34, line 23). Furthermore, in the art, flip-type doors can be replaced with flip-type slit valves. **Maydan et al.** discloses a filtering system that is used to remove particulates from the load lock chamber (col. 13, line 61-col. 15, line

35). Again, **Hofmeister** is applied as above. Applicants submit that incorporating any or all of these features into **Hofmeister's** substrate transport and load lock assembly does not render the instant invention obvious for the reasons stated *supra*. Flip-type doors or valves and a filtering system are specific limitations recited in dependent claims 14-16 and 17, respectively, which can be incorporated into the invention of amended claim 1 to further improve function and the quality of the processed substrates. They can not render the instant invention obvious in combination with **Hofmeister** if **Hofmeister** in combination with **Ghanayem et al.** does not render the invention recited in independent claim 1 obvious.

In view of the above remarks, Applicants respectfully submit that obviousness can not be established by combining the teachings of the prior art absent some teaching, suggestion or motivation supporting the combination to do so. Absent a suggestion or teaching in **Ghanayem et al.** of a separate cooling plate or any cooling means, Applicants' invention as recited in amended claim 1 is not rendered obvious by combining **Ghanayem et al.** with **Hofmeister**. Thus, the invention as a whole was not obvious to one

of ordinary skill in the art at the time the invention was made. Accordingly, Applicants respectfully request that the rejection of claims 3-11 and 14-17 under 35 U.S.C. §103(a) be withdrawn.

This is intended to be a complete response to the Office Action mailed December 13, 2001. If any issues remain outstanding, the Examiner is respectfully requested to telephone the undersigned attorney of record for immediate resolution. Applicants believe that no fees are due, however, should this be in error, please debit Deposit Account No. 07-1185 on which the undersigned is allowed to draw.

Respectfully submitted,

Date: June 13, 2002



Benjamin Aaron Adler, Ph.D., J.D.
Registration No. 35,423
Counsel for Applicant

ADLER & ASSOCIATES
8011 Candle Lane
Houston, Texas 77071
(713) 270-5391 (tel.)
BADLER1@houston.rr.com

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 1 as follows:

1 (amended). A substrate processing system,
comprising:

a cassette load station;

a load lock chamber, ~~wherein~~ said load lock chamber
~~comprises~~ comprising a double dual slot load lock constructed at a
same location; wherein each of said dual slot load locks further
comprises a heating plate and a cooling plate, said heating plate and
said cooling plate located in different slots of said dual slot load lock;

a transfer chamber, wherein said transfer chamber is
centrally located; and

one or more process chambers, wherein said process
chambers are located about the periphery of said transfer chamber.

Please cancel claim 3.

Please amend claim 4 as follows:

4. (amended) The substrate processing system of claim 3 1, wherein said heating plate is a stationary plate or a moving plate.

Please amend claim 6 as follows:

6. (amended) The substrate processing system of claim 3 1, wherein said heating plate heats up to a temperature of about 400°C.

Please amend claim 7 as follows:

7. (amended) The substrate processing system of claim 3 1, wherein said cooling plate is a stationary plate or moving plate.

Please amend claim 9 as follows:

9. (amended) The substrate processing system of claim 3 1, wherein said cooling plate cools the temperature down from about 350°C to about 80°C.